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claims 8-15, 31, and 55-60 have been rejected under 35 U.S.C 103(a) as being unpatentable over Zhang, et al. and further in view of Riser, et al. (5,911,020; 5,857,041).

The above rejections of the claims 1-70 on the stated art grounds are traversed, and consideration of the patentability of the claims 1- 70 is requested, in light of the ensuing remarks.

Arguments for Patentability

It is asserted that the UV disinfection system for treating drinking water according to the present invention is substantially different from those described in the prior art patents cited and relied upon by the Examiner, namely Free and Zhang, et al.

In particular, Free actually teaches away from the present invention, in that Free teaches a parallel fluid flow with respect to the UV light source, which provides a cross-current irradiation of the fluid. Furthermore, Zhang et al. nowhere teaches or suggests the use of a vertical riser configuration for use as a fluid treatment method and apparatus as taught and claimed in the present invention.

Free (4,008,045) claims a coaxial UV disinfection chamber with a fluid flow deflector plate functioning to deflect to the fluid and induce turbulence via vanes.

The first claim states that ".....each of said vanes being essentially in the form of a step extending in the direction of the longitudinal axis of the radiation source, said step being formed by first and second horizontal treads interconnected by a vertical riser,....." This is further described in the specification in Column 3, lines 37-39, as "horizontal treads...interconnected by a vertical riser (i.e., the vertical section of notch 36); thus,

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Free's use of the label "vertical riser" is not equivalent to the overall counter-current system set forth by the present invention, which is referred to as the vertical riser configuration system, but is merely a small component within a joining section of the components of Free.

Claims 1 and following are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Free and Zhang et al.

Free teaches a fluid disinfection apparatus:

- A UV light source
- irradiates a fluid
- and diffuser structure is provided to
 - a. enhance turbulence and
 - b. radiation contact zone
- for more efficient sterilization of the fluid.
- Diffuser structure can be stair step configuration.

However, the examiner goes on to state that Free teaches the desire to provide a flow of the fluid toward the UV source at a given rate for effective disinfection. Free never teaches providing a fluid treatment apparatus wherein the flow of fluid is toward the UV source. All embodiments set forth in Free are co-axial apparatuses wherein the fluid flow is parallel, or co-axial to the UV light source and the UV light source is submerged or surrounded by the fluid. Such apparatuses provide cross-current irradiation of the fluid, that is, the irradiation is directed across the path of the fluid. In this configuration, fluid that enters the apparatus towards the center of the apparatus and proceeds in a laminar flow towards the exit receives more irradiation than fluid that is entering the apparatus near the periphery and proceeds via laminar flow towards the exit. As Free correctly teaches, such a reactor under laminar flow conditions does not uniformly irradiate the fluid passing through the apparatus. Free therefore teaches a

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diffuser structure to induce turbulence such that the fluid is more uniformly irradiated. Therefore, Free's invention is designed specifically to alleviate the problem encountered with cross-current, or coaxial, apparatuses, not countercurrent apparatuses, such as the vertical riser configuration (VRC) as set forth in the present invention specification and claims. Therefore, the present invention is not merely the application of a turbulence-inducing device to a UV apparatus, but is rather a non-submerged UV system with an optical component, as described in Claim 1 of the present invention:

1. An ultraviolet disinfection (UV) system for treating waste-containing fluid, the system comprising at least one light source positioned within a housing and connected to a power source for producing a UV light output from the housing, *the system including at least one optical component positioned between the at least one light source and the UV light output from the housing*, thereby producing a focused, controllable UV light output that has at least one UV dose zone for providing effective sterilization of microorganisms within the fluid.

The examiner's objections in regard to Free are therefore traversed.

The examiner further cites Zhang et al.

Zhang et al. teach:

- Method and apparatus for the reduction of organic contaminants in fluid, including:
- Non-submerged UV light source
- UV-transmissive boundaries between the UV light source and reactor
- Open reactor with no boundary between the UV light source and fluid
- Different reactor configurations, including
 - Continuous stirred batch reactor, where catalyst is added to a batch, stirred while illuminated with UV light, then the catalyst is separated. This reactor design is somewhat similar to RL's reservoir system.
 - Plug flow reactor, wherein water or water/catalyst slurry passes single or multiple times through a UV zone.

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Zhang et al. do NOT teach :

- Microbial sterilization of fluids with their apparatus
- Focusing or other light-manipulating optics between the UV light source and reactor
- FOTL for transmission of UV light
- Countercurrent UV irradiation

Taken together, Free and Zheng do not teach, suggest, or imply any of the following, which are taught and claimed in the present invention:

- Focusing or other light-manipulating optics between the UV light source and reactor
- FOTL for transmission of UV light
- Countercurrent UV irradiation (as provided by the VRC)

A vertical riser configuration (VRC) is more advantageous than other reactor designs, in particular those of the prior art, e.g., Free and Zhang et al. The VRC, because it uniformly irradiates every particle of fluid coming through it, allows the designers to more closely scale the size of the UV light source and reactor to the desired capacity. Notably, by contrast to the present invention, co-axial and cross-current reactors, including those of the prior art, have to be overbuilt to ensure that the least irradiated particle – one traveling along the exterior wall of the reactor in laminar flow, or even turbulence-induced laminar flow – is sterilized.

The use of fiber optic transmission taught by Riser, et al. is not properly combined with the system according to the present invention inasmuch as Riser et al., while teaching fiber optic transmission is not motivated by either Free or Zhang to combine fiber optic transmission with the present invention. Also, the fiber optic transmission elements for transmission of light from a source of Riser are nowhere indicated to be used with UV light sources, which require UV transmissive materials to even be functional.

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Furthermore, the use of optical components positioned between the light source and the output to focus and control the light output such that the intensity and direction of the light output is truly counter-current to the flow of water to be treated by the UV light for disinfection. Applicant had already previously cited US Patent No. 6,090,296 issued July 18, 2000 to Oster, which is a prior art reference cited in the Information Disclosure Sheet (IDS) that was filed by the Applicant with the patent application filing, and which is considered relevant by Applicant since this application was filed, which describes a co-axial reactor design that positions the light at the top of the reactor; however, the light emitted by the light source of that prior art reactor does not provide truly counter-current light output, because no optical components are included to focus and intensify the output light, e.g., optical lenses. Without the use of the optical components to focus and control the light output, the only means for increasing the UV light intensity is to scale up the UV light source to provide a source with higher light output on its own, or to use additional UV light sources, as specifically taught and described by Oster; thus, Oster also teaches away from the present invention, which expressly incorporates the use of optics in order to intensify the light output from a given source, thereby eliminating the need to use a higher intensity light or multiple lights to increase the output light intensity for each reactor.

Claims 1-70, not including canceled claim 50, are asserted to be in patentable condition. Allowance of these claims is hereby respectfully requested. In the event that the Examiner finds additional minor modifications that would place these claims in allowable condition, the Examiner is respectfully requested to make telephonic contact

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with the Attorney of Record to discuss and make changes via Examiner's Amendment to place the claims in condition for allowance.

The above rejections of the claims 1-70 on the stated art and utility grounds are traversed, and consideration of the patentability of the claims 1-70, not including canceled claim 50, is requested, in light of the foregoing remarks. Favorable action is therefore requested.

**TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE-
PATENTING REJECTION OVER ANOTHER PENDING APPLICATION**

The owner, RemoteLight, Inc., of all interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 USC 154 to 156 and 173 as shortened by any terminal disclaimer filed prior to the date of the grant of any patent granted on pending second application number 09/630,245 filed 07/31/2000, and on pending third application number 09/723,679 filed 11/28/2000, of any patent on the pending second or third application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the second or third applications are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend beyond the expiration

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date of the full statutory term defined in 35 USC 154 to 156 and 173 as shortened by any terminal disclaimer filed prior to the date of the patent grant, in the event that any such granted patent: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are so made punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

CONCLUSION

In view of the foregoing, claims 1-70, not including canceled claim 50, constituting the claims pending in the application, are submitted to be fully patentably and in allowable condition, which were amended consistent with the telephonic interview, suggestions, and recommendations of the Examiner to address and overcome the rejections.

If any issues remain outstanding, incident to the allowance of the application, Examiner Thornton is respectfully requested to contact the undersigned attorney at (919)-664-8222 or via email at jinang@trianglepatents.com to discuss the resolution of such issues, in order that prosecution of the application may be concluded favorably to the applicant, consistent with the applicant's making of a substantial advance in the art

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and particularly pointing out and distinctly claiming the subject matter that the applicant regards as the invention.

Respectfully submitted,

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